

CHARLES COUNTY WATERSHED ASSESSMENTS

Planning Commission Meeting
February 26, 2018



Program Goals



- Total Maximum Daily Loads (TMDLs)
 - Urban Stormwater Sector
 - Other sectors (agricultural, wastewater, septic systems, forest, air)
 - NPDES Permit
- Chesapeake Bay TMDL – nitrogen, phosphorus, sediment
 - By 2025
- Local TMDLs
 - Mattawoman Creek – nitrogen, phosphorus
 - Lower Patuxent - bacteria
- Impervious Surface Restoration
 - 20% Countywide
 - By 2019

Chesapeake Bay TMDL



Charles County

- Developed 2009, EPA Approved 2010
- Baseline 2010

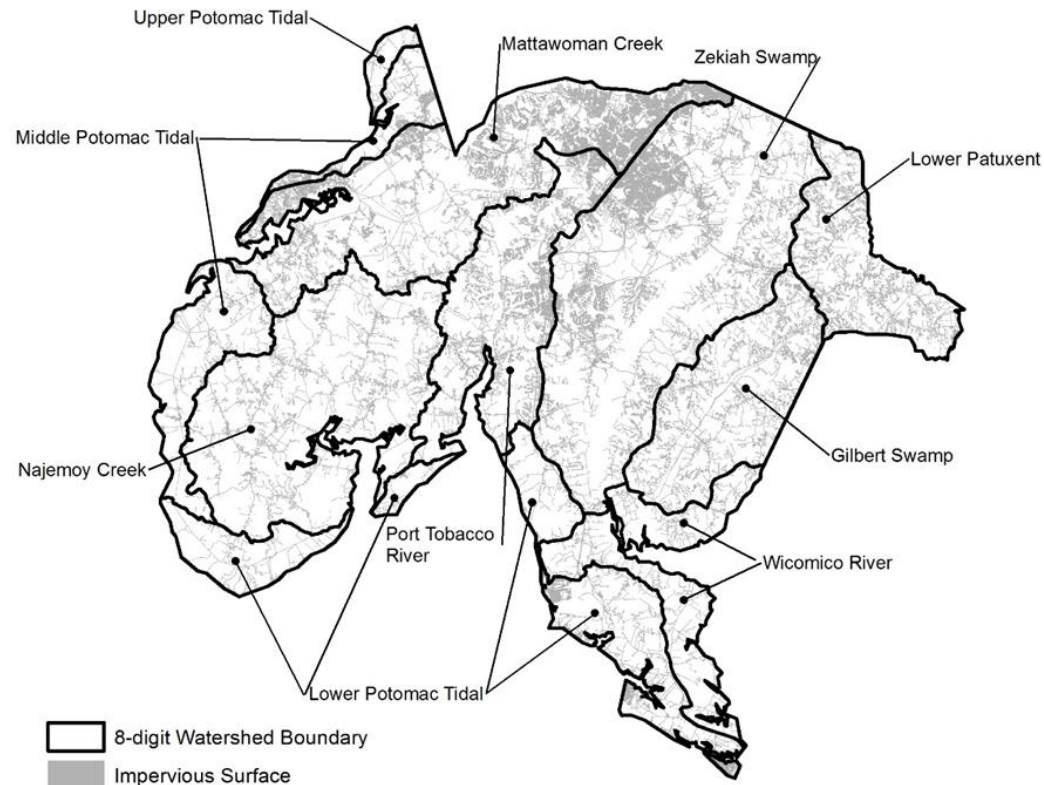
Baseline and Target	TN-EOS lbs/yr	TN-DEL lbs/yr	TP-EOS lbs/yr	TP-DEL lbs/yr	TSS-EOS lbs/yr	TSS-DEL lbs/yr
Calibrated 2010 Baseline Load	235,070	178,693	20,037	17,690	5,739,174	6,477,189
Target Percent Reduction	18.19%	20.24%	37.70%	38.26%	-	-
Calibrated Target Reduction	42,759	36,167	7,554	6,768	-	-
Calibrated Bay TMDL WLA	192,311	142,526	12,483	10,922	-	-

Impervious Surface Restoration



- Baseline analysis

- County impervious area 9,941.7 acres
- Treated impervious area 2,893.9
- Untreated impervious area 7,047.8
- 20% Goal – 1,409.6



Watershed Assessment Goals

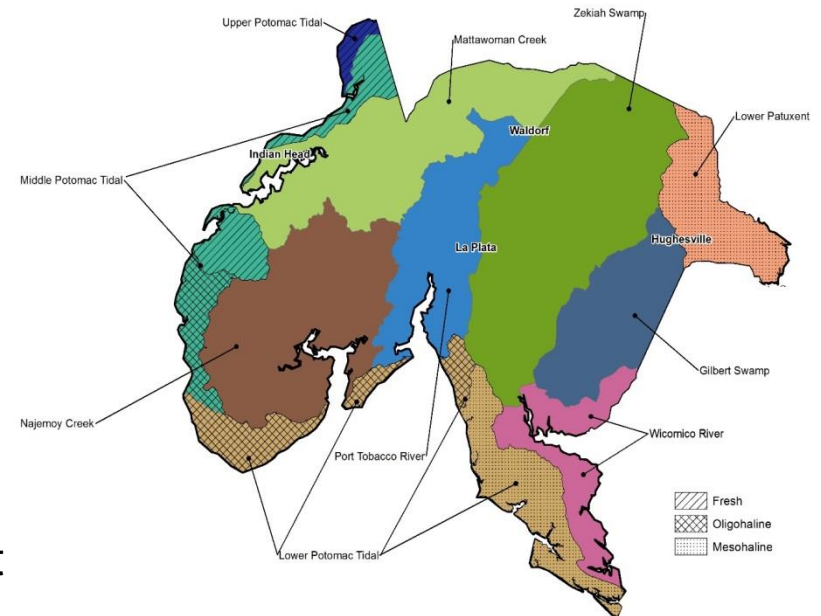


- Assessment Elements (IV.E.1.b.i-v)
 - Determine current water quality conditions
 - Visual watershed inspection
 - Identify quality problems
 - Prioritize all structural and nonstructural water quality improvement projects
 - Specify pollutant load reduction benchmarks and deadlines towards meeting applicable WLAs
- Support Restoration Plan Development (IV.E.2.a and b)

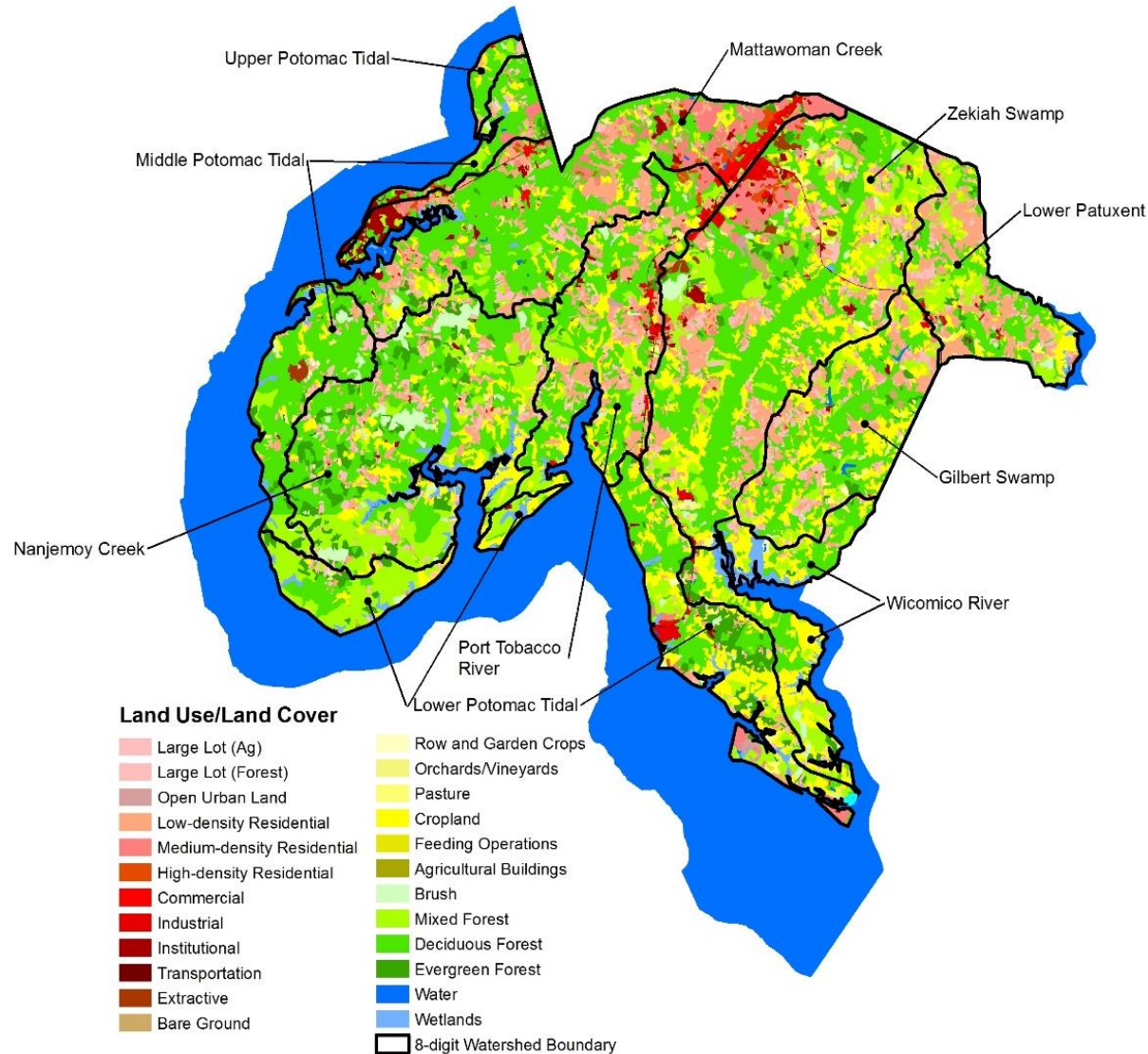
Schedule



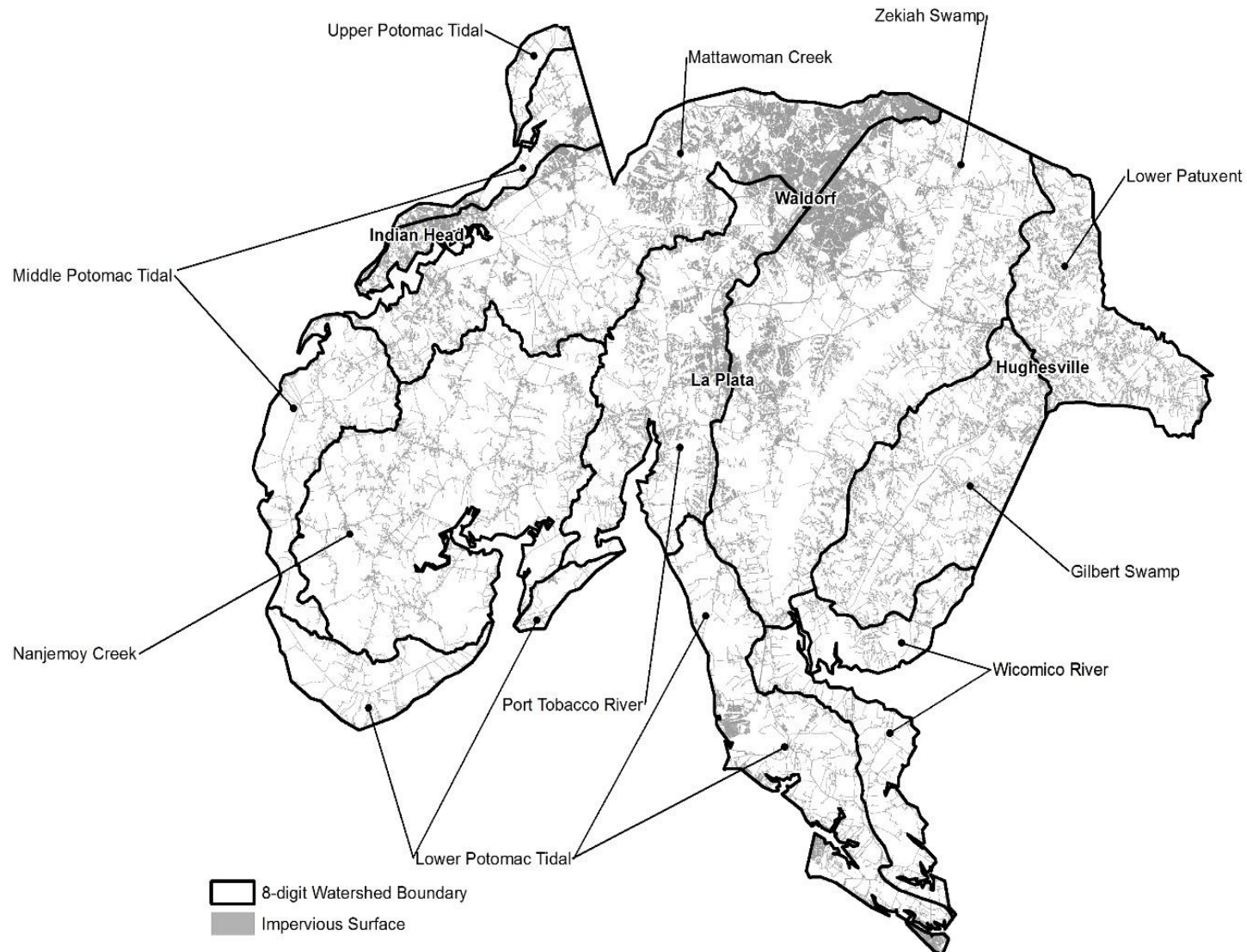
- Complete all watersheds by end of permit (2019)
- Schedule
 - 2015 Complete
 - Port Tobacco River
 - 2016 Complete
 - Mattawoman Creek, Lower Patuxent
 - 2016 Draft
 - Gilbert Swamp, Zekiah Swamp, Wicomico River
 - 2017 Draft
 - Potomac River (Upper, Middle and Lower Tidal), Nanjemoy Creek



Watersheds – Land Use



Watersheds - Impervious



Watersheds



Watershed	Total Area (acres)	Urban (%)	Agriculture (%)	Forest (%)	Water (%)	Other (%)	Imperviousness (acres and %)	
Gilbert Swamp	24,651	25.0%	25.9%	47.5%	0.8%	0.9%	1,010.7	4.1%
Mattawoman Creek	44,572	39.5%	7.3%	51.2%	0.5%	1.5%	4,323.5	9.7%
Nanjemoy Creek	47,542	14.7%	12.4%	68.4%	0.5%	4.0%	903.3	1.9%
Patuxent River Lower	18,257	38.9%	14.3%	44.5%	0.4%	1.8%	839.8	4.6%
Port Tobacco River	28,021	33.0%	15.8%	49.8%	0.4%	1.1%	1,961.5	7.0%
Potomac River L Tidal	30,490	12.7%	22.3%	58.7%	2.2%	4.1%	945.2	3.1%
Potomac River M Tidal	19,422	16.7%	5.8%	72.7%	1.8%	3.0%	621.5	3.2%
Potomac River U Tidal	2,091	15.4%	9.3%	72.6%	2.2%	0.5%	48.1	2.3%
Wicomico River	16,196	7.5%	35.0%	45.2%	1.5%	10.7%	388.7	2.4%
Zekiah Swamp	65,110	27.1%	18.5%	53.1%	0.0%	1.3%	3,841.5	5.9%



Field Assessment Methods

- Uplands
 - Neighborhood Source Assessments
 - Hot Spot Investigations
- Lowlands
 - Stream Corridor Assessments
 - Water Quality Sampling (synoptic survey)

Year	Watershed	HSI Sites	NSA Sites	Synoptic Sites	SCA Reaches (miles)
2014	Port Tobacco	26	15	47	8
2015	Mattawoman Creek	21	10	51	6
2015	Lower Patuxent	1	4	14	2
2016	Zekiah Swamp	9	5	54	3
2016	Gilbert Swamp	5	4	34	3
2016	Wicomico River	6	2	16	2
2017	Potomac River	9	12	48	5
2017	Nanjemoy Creek	11	7	49	4

Neighborhood Source Assessment



- Upland Assessments
 - Single family detached, townhomes, apartments, mobile homes
- Types of Issues
 - High and medium management lawns
 - Dirty curb and gutters
 - Downspouts to impervious
 - No stormwater management
- Pollution Sources
 - Nutrients – Fertilizer / pet waste
 - Bacteria – Pet waste
 - Sediment
 - Oil and grease – Improper disposal



Hotspot Site Investigation



- Upland Assessments

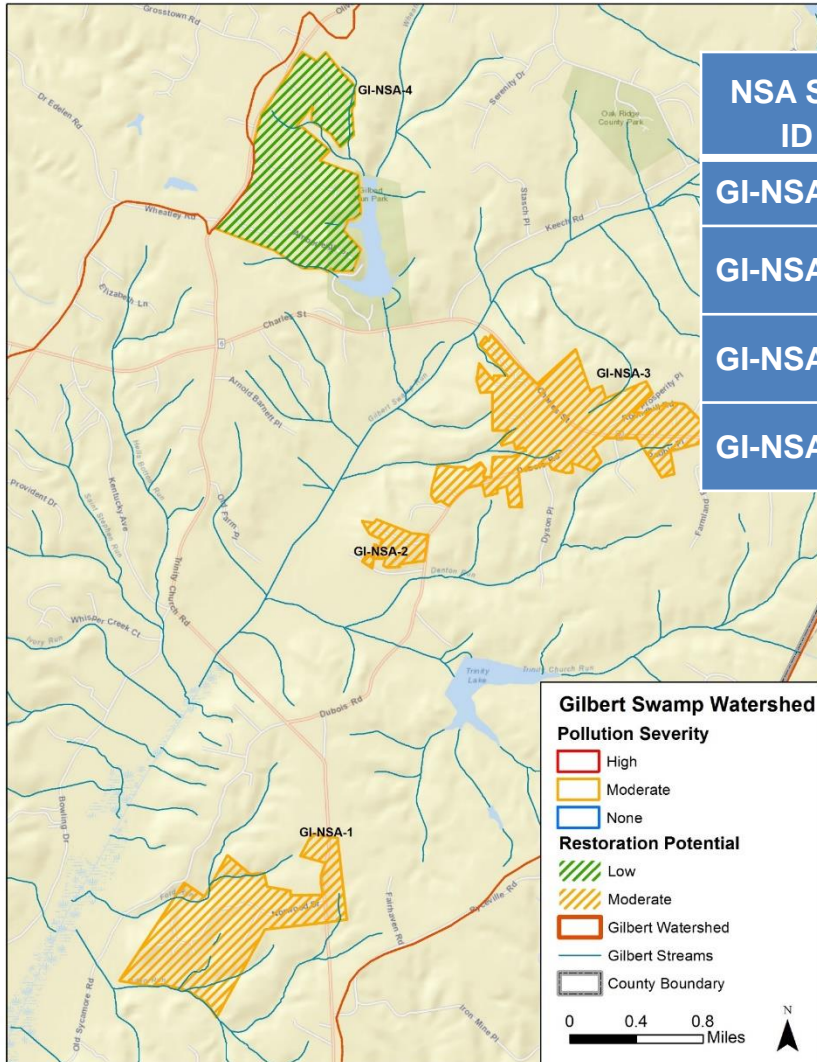
- Gas stations, commercial car wash, maintenance facilities, chemical storage

- Types of Issues

- Vehicle operations
- Outdoor materials
- Waste management



Example Result – Gilbert Swamp



NSA Site ID	Neighborhood / Subdivision	Pollution Severity	Pollution Sources	Restoration Potential
GI-NSA-1	Norwood Drive	Moderate	Nutrients	Moderate
GI-NSA-2	Hillmeade Court	Moderate	Nutrients	Moderate
GI-NSA-3	off Charles Street	Moderate	Nutrients	Moderate
GI-NSA-4	off Olivers Shop Road	Moderate	Nutrients	Low

- Potential Actions
 - Rain garden
 - Rain barrels
 - Swale retrofits

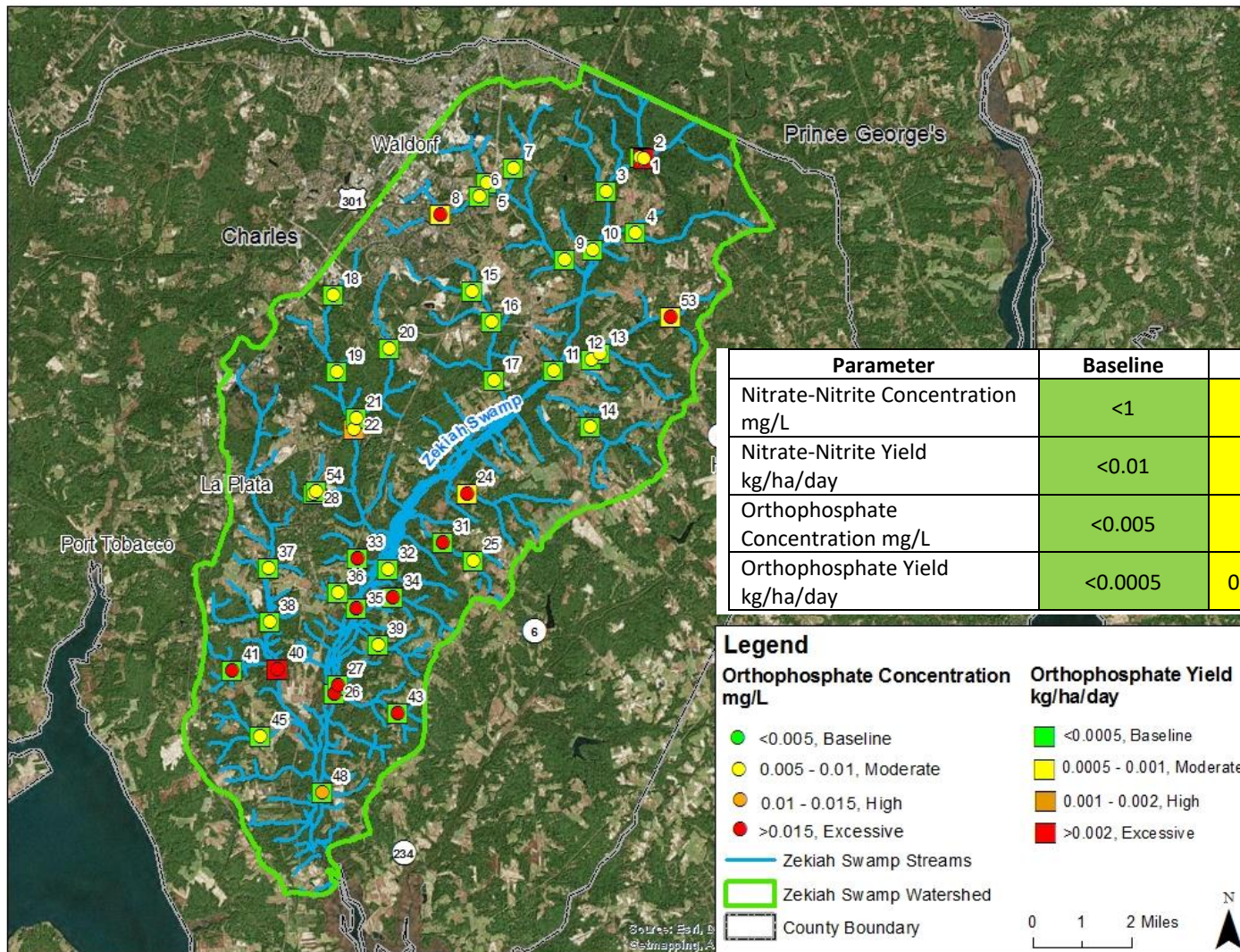


Water Quality Sampling

- Methods
 - Synoptic Water Quality Sampling
 - 313 Total sites sampled
 - In-situ (pH, temp, conductivity, DO, turbidity)
 - Stream Discharge
 - Baseflow grabs

Parameter	Method	Detection Limit	Units
Enterococcus (E. coli)	Colilert	1	MPN/100 ml
Ortho-phosphate Phosphorus	EPA 365.1	0.01	mg/L
TKN	EPA 351.2	0.5	mg/L
Nitrate + Nitrite	EPA 353.2	0.5	mg/L
Total Nitrogen	EPA 351.2 + 353.2	1	mg/L
Total Phosphorus	EPA 365.1	0.01	mg/L

Example Result - Zekiah Swamp



Parameter	Baseline	Moderate	High	Excessive
Nitrate-Nitrite Concentration mg/L	<1	1 – 3	3 – 5	>5
Nitrate-Nitrite Yield kg/ha/day	<0.01	0.01 – 0.02	0.02 – 0.03	>0.03
Orthophosphate Concentration mg/L	<0.005	0.005 – 0.01	0.01 – 0.015	>0.015
Orthophosphate Yield kg/ha/day	<0.0005	0.0005 – 0.001	0.001 – 0.002	>0.002

Legend

Orthophosphate Concentration mg/L

- <0.005, Baseline
- 0.005 - 0.01, Moderate
- 0.01 - 0.015, High
- >0.015, Excessive

— Zekiah Swamp Streams

— Zekiah Swamp Watershed

— County Boundary

Orthophosphate Yield kg/ha/day

- <0.0005, Baseline
- 0.0005 - 0.001, Moderate
- 0.001 - 0.002, High
- >0.002, Excessive

0 1 2 Miles



Stream Corridor Assessment



- Following MDNR SCA Protocol (Yetman, 2001)
- Erosion (ES), Exposed pipe (EP), Pipe outfall (PO), Inadequate buffer (IB), Fish barrier (FB), Trash dumping (TD), Channel alteration (CA), Unusual condition (UC)
- Prioritized areas to assess

Data Element	Factors for selection	Factors for exclusion
Topography	Narrow, steep valleys and side slopes, tortuous meanders	Flat, wide floodplains
Stormwater infrastructure (outfalls, BMPs, BMP treated areas, Stormwater by Era)	Reaches downstream of untreated or undertreated areas	Reaches downstream of treated areas
Forest Cover	Lack of riparian buffer and forest	Adequate forest cover, wide riparian buffers
Development	Higher density development	Low density development and agriculture

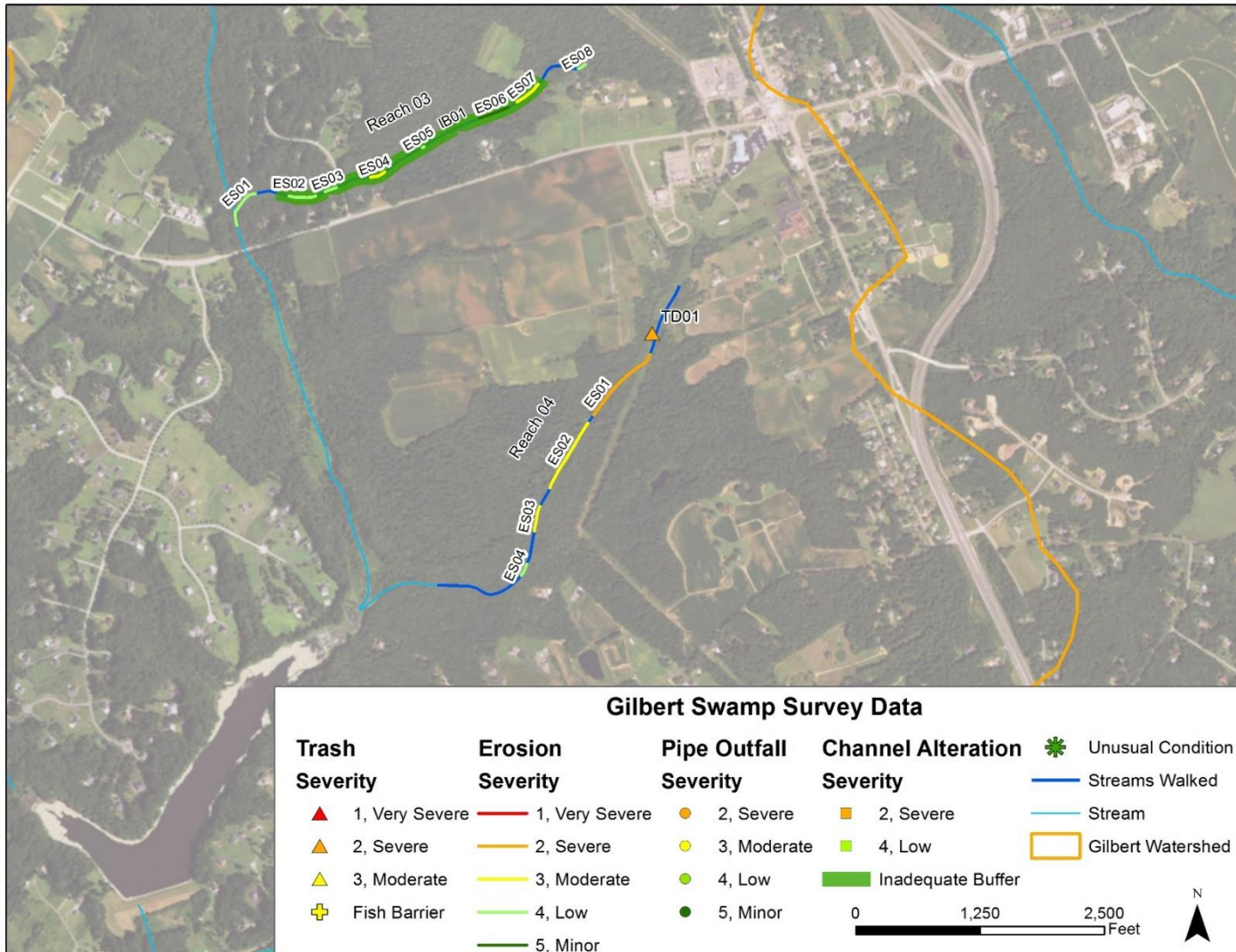
Example Result – Nanjemoy Creek



Potential Problems	Total	Very Severe	Severe	Moderate	Low	Minor
Erosion (1.7 miles)	13	0	1	6	3	3
Buffer (262 feet)	1	0	0	0	1	0
Pipe Outfall	1	0	0	1	0	0
Fish Barrier	2	0	0	1	1	0
Trash	0	0	0	0	0	0
Channel Alteration	0	0	0	0	0	0
Construction	0	0	0	0	0	0
Exposed Pipe	0	0	0	0	0	0
Unusual Conditions	2	0	0	1	1	0
Total	19	0	1	9	6	3



Example Result – Gilbert Swamp



Project Identification Methods and Results



- Upland Assessments

- Retrofit Reconnaissance Investigation
 - Commercial
 - Neighborhoods
 - Existing dry ponds
 - Pond outfalls



- Types of Issues

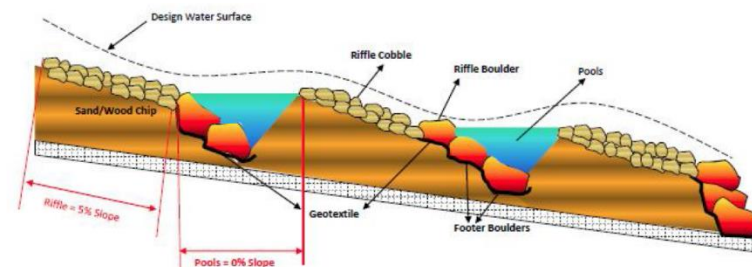
- No stormwater management
- Dry ponds – older technology
- Erosion at outfalls
- Failing/eroded concrete lined channels



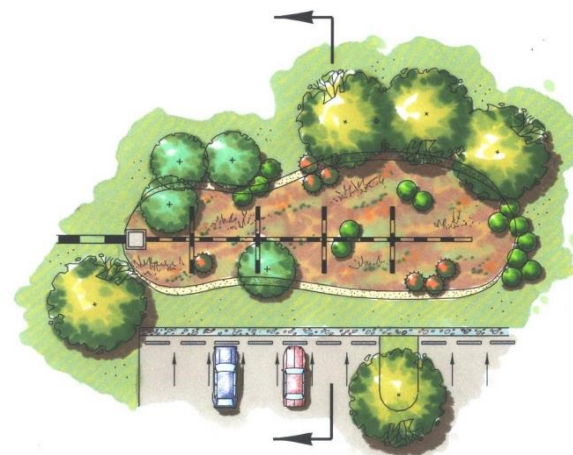
Project Identification



- Stormwater BMPs and Alternative treatments
 - Bioretention
 - Wet pond retrofits
 - Created wetlands
 - Infiltration basin
 - Step Pool Stormwater Conveyance
 - Stream restoration
 - Shoreline restoration



Year	Watershed	Stream Restoration	Shoreline Restoration	Stormwater Facilities
2016	Zekiah Swamp	1	0	7
2016	Gilbert Swamp	5	0	5
2016	Wicomico River	1	0	3
2017	Potomac River	8	0	12
2017	Nanjemoy Creek	1	2	8



Project Identification



- Reforestation

- Identified through SCA, Upland Assessments, and Desktop assessment
- Focus on riparian buffers, County owned properties, parks, church parcels

Year	Watershed	Reforestation Sites	Total Acres
2014	Port Tobacco	6	82
2015	Mattawoman Creek	21	31
2015	Lower Patuxent	1	2
2016	Zekiah Swamp	8	21
2016	Gilbert Swamp	3	4
2016	Wicomico River	1	0.5
2017	Potomac River	4	15
2017	Nanjemoy Creek	1	9



Programmatic Practices

County Practices

- Street Sweeping
- Inlet Cleaning
- Septic Practices

Homeowner Practices

- Rain gardens
- Rain barrel
- Downspout disconnection



Programmatic Practices

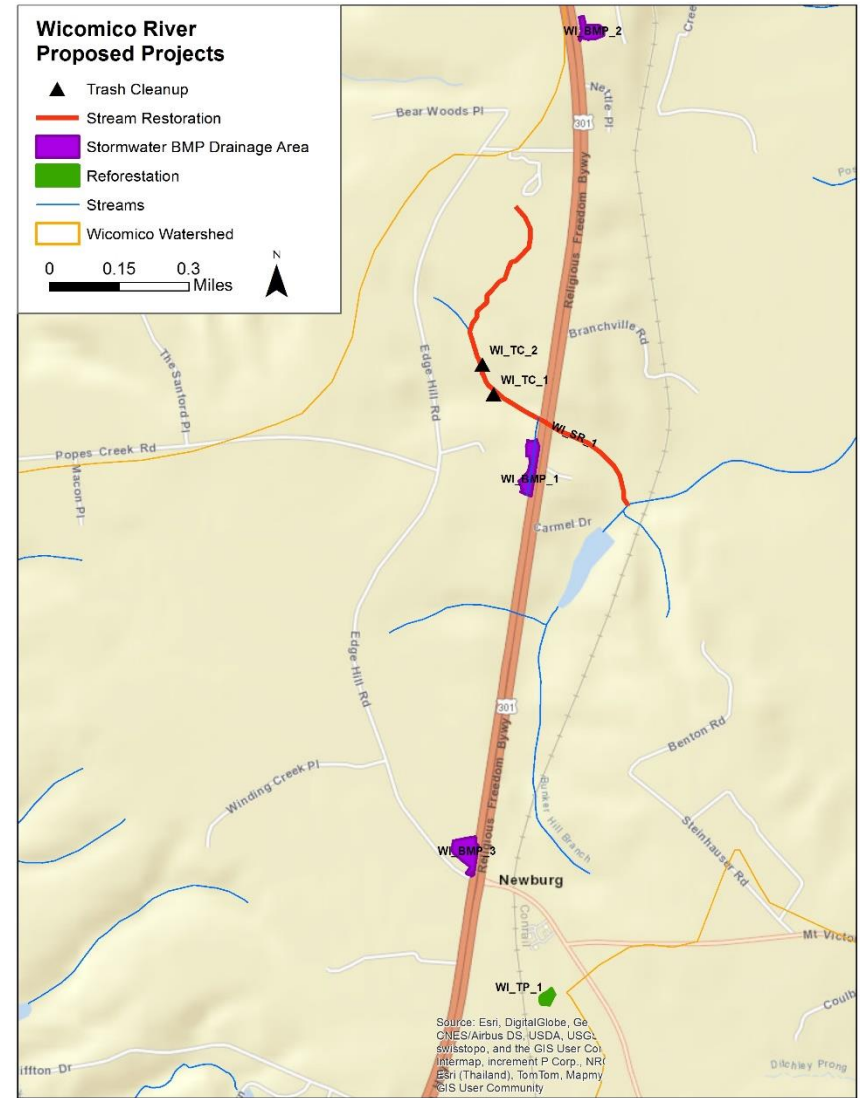
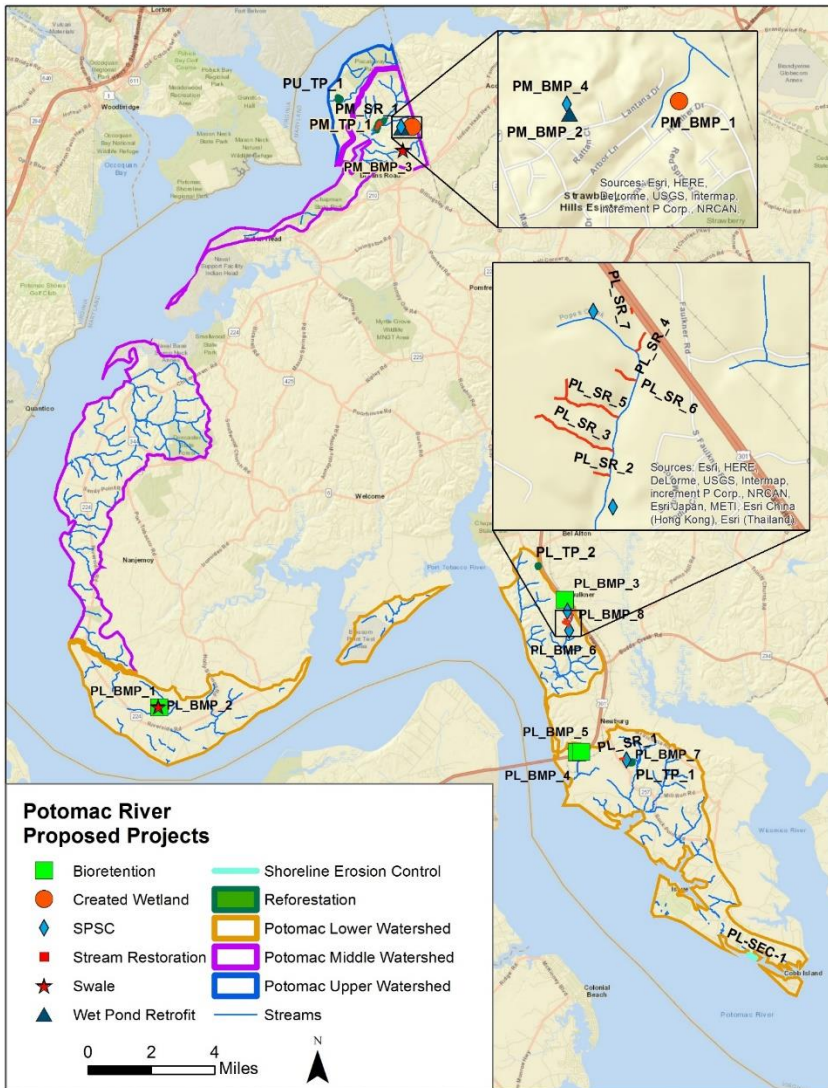


- Trash Cleanups
 - Identified through SCA

Year	Watershed	Trash Cleanup Sites
2014	Port Tobacco	7
2015	Mattawoman Creek	7
2015	Lower Patuxent	0
2016	Zekiah Swamp	6
2016	Gilbert Swamp	2
2016	Wicomico River	2
2017	Potomac River	0
2017	Nanjemoy Creek	0



Example – Potomac & Wicomico





Other Reporting Elements

- Project Prioritization and Ranking
 - Benefits
 - Constraints
 - Cost
- Inclusion of projects from other County efforts
- Cost estimates
- Estimated treatment levels
 - Impervious Surface Reduction
 - Local TMDLs
 - Bay TMDL
- Appendices
 - Additional data and details

Example Impervious Treatment Estimate - Zekiah



Impervious Accounting	Zekiah Swamp
Baseline Impervious Treatment	
Total Impervious Area*	3,783.7 acres
County MS4 Impervious Area	2,651.0 acres
Impervious Treated	718.7 acres
Impervious Treated Percent	27%
Impervious Untreated	1,932.3 acres
Impervious Untreated Percent	73%
FY 17 Progress	
Impervious Treated	116.2 acres
Potential Impervious Treatment	
Operational Practices (Street Sweeping, Inlet Cleaning)	39.7 acres
Septic Connections	0.0 acres
Septic Pump Outs	7.1 acres
Septic Upgrades	1.6 acres
Homeowner Practices	11.3 acres
Level 2- Construction	0.0 acres
Level 3- Full Design	1.2 acres
Level 8- Alternate Feasibility/Concepts	114.7 acres
Level 9- KCI Projects	24.9 acres
Level 11- ISA Baseline Reduction	522.7 acres
Potential Impervious Treatment	723.2 acres
Summary of Projected Progress	
Impervious Untreated	1,932.3 acres
FY17 Progress- Impervious Treatment	116.2 acres
Potential Impervious Treatment	723.2 acres
Total Progress and Potential Treatment	839.4 acres
Percent of Untreated Impervious Treated	43%

Example Pollutant Load Reduction Estimate - Zekiah



	TN- EOS (lbs/yr)	TP- EOS (lbs/yr)	TSS*- EOS (lbs/yr)
Bay TMDL Baseline and Targets			
2010 Baseline Loads	235,070	20,037	5,739,174
Target Percent Reduction PLANNED REDUCTIONS	18.2%	37.7%	-
Calibrated Target Reduction	42,759	7,554	-
Calibrated Bay TMDL WLA	192,311	12,483	-
2017 Progress Reductions			
Gilbert Swamp	0.2	14.4	0.0
Mattawoman Creek	663.1	192.2	51,144.3
Nanjemoy Creek	166.0	159.3	280,400.9
Patuxent River Lower	56.8	58.3	89,546.1
Port Tobacco River	232.8	134.9	61,586.6
Potomac River L Tidal	1,117.6	929.3	1,827,996.7
Potomac River M Tidal	245.5	50.5	19,556.5
Potomac River U Tidal	120.5	108.6	217,985.0
Wicomico River	231.8	211.0	350,722.4
Zekiah Swamp	663.0	247.2	56,380.6
Restoration Reductions	3,497.4	2,105.8	2,955,319.1
Planned Reductions			
Zekiah Level 9- KCI Structural and Homeowner Projects	289.9	87.9	16,663.9
Zekiah Level 2-11 Structural Projects	4,553.9	1,091.3	349,199.3
Zekiah Operational- Street Sweeping/Inlet Cleaning	347.0	139.0	41,641.7
Total Zekiah Planned Reductions	5,190.8	1,318.2	407,504.9
Total Other Watershed Reductions	24,652	7,596	3,515,270
Total County-wide Planned Reductions	29,843	8,914	3,922,775
Totals			
Reduction (Progress + Planned)	33,313	10,781	6,878,094
Reduction Percent (Progress + Planned)	14.2%	53.8%	-
Reduction Percent Towards Target Goal	77.9%	142.7%	-
Reduction Remaining for Treatment	9,446	0	-

Example Cost Estimate - Zekiah



	Total Initial Cost	Cost Over 20 Years
Zekiah Swamp		
Level 9- KCI Projects	\$1,825,290	\$2,357,503
Stream Restoration	\$544,380	\$694,781
Stormwater Management	\$1,042,480	\$1,259,794
Reforestation	\$232,430	\$402,928
Trash Cleanups	\$6,000	N/A
Level 2- In Construction	\$0	\$0
Level 3- Full Design	\$898,320	\$1,077,984
Level 5-8 & 11- Concept	\$7,633,030	\$10,246,439
Street Sweeping	\$53,743	\$1,074,855
Inlet Cleaning	\$15,504	\$310,073
Homeowner Practices	\$1,353,260	
Septic Practices	\$139,689	\$1,580,444
Total	\$11,020,516	\$16,647,298



Next Steps

- Charles County continues to implement projects and programs
 - Feasibility studies
 - Cost benefit prioritization updates
- Adaptive Management
 - Annual re-evaluation of progress, programs and policy
 - FY2017 Progress Reported to MDE in Annual NPDES Report



Next Steps

- Public Review and Comment Period
 - February 26 – March 28
 - Watershed Assessment Documents
 - <http://www.charlescountymd.gov/pgm/planning/watershed/watershed-assessments>
 - Submit Comments to:
Karen Wigger
Department of Planning and Growth Management
wiggerk@charlescountymd.gov
- MDE Submittal
 - Address public comments
 - Submit to MDE for review and comment